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SIXTY–FOURTH REPORT
OF
THE STATE GEOLOGIST

(1970–1971)

CALIFORNIA DIVISION OF MINES AND GEOLOGY
1416 Ninth Street, Sacramento, California 95814

1971

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STATE OF CALIFORNIA ▪ THE RESOURCES AGENCY ▪ DEPARTMENT OF CONSERVATION

Sixty-Fourth Report of the State Geologist

ACTIVITIES OF THE CALIFORNIA DIVISION OF MINES AND GEOLOGY

July 1, 1970, through June 30, 1971

Wesley G. Bruer, State Geologist and Chief
California Division of Mines and Geology
The Resources Building, Sacramento

STATE OF CALIFORNIA
DEPARTMENT OF CONSERVATION

THE RESOURCES AGENCY
DIVISION OF MINES AND GEOLOGY

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TATE OF CALIFORNIA—THE RESOURCES AGENCY RONALD REAGAN, Governor

EPARTMENT OF CONSERVATION
DIVISION OF MINES AND GEOLOGY
IVISION HEADQUARTERS
ESOURCES BUILDING, ROOM 1341
416 NINTH STREET
ACRAMENTO CA 95814

istrict Offices:
LOS ANGELES
Junipero Serra Bldg., Rm. 1065
107 South Broadwoy
90012

SACRAMENTO
Resources Bldg., Rm. 118
1416 Ninth Street
95814

SAN FRANCISCO
Ferry Building
94111

September 1, 1971

Hon. James G. Stearns
Director of Conservation
Sacramento, California

Dear Mr. Stearns:

Here is the Sixty-Fourth Report of the State Geologist. It is a summary of the work of the California Division of Mines and Geology for the period July 1, 1970, through June 30, 1971.

The Division adjusted well to the relocation of headquarters staff and to the reorganization of the previous year. Productivity increased in nearly all phases of the Division's program. A brief comparison with the Sixty-Third Report will indicate that this increase is most marked in Seismic and Fault Investigations, Urban Mapping, and Marine Geology. The only category which did not show an increase is the number of major publications released. This is due to the lag time necessary for review and processing. We look forward to seeing the past year's increased activity reflected by release of a larger number of these useful publications in the coming year.

We are also pleased to report that the increased work of the Division was accomplished without a correlative increase in expenditures, in spite of the higher over-all cost of doing business.

The Division responded effectively within minutes to the geologic emergency of the San Fernando earthquake. Our preliminary report, published in California Geology, was the first of the scientific papers to be printed. Research work on the earthquake continued throughout the remainder of the fiscal year and will continue into the ensuing year.

Respectfully submitted,

Wesley G Bruer

Wesley G. Bruer
State Geologist and Chief

STATE OF CALIFORNIA—RESOURCES AGENCY
RONALD REAGAN, Governor

DEPARTMENT OF CONSERVATION

DIVISION OF FORESTRY
DIVISION OF MINES AND GEOLOGY
DIVISION OF OIL AND GAS
DIVISION OF SOIL CONSERVATION

SACRAMENTO, CALIFORNIA
1416 Ninth Street

September 1, 1971

Hon. N. B. Livermore, Jr.
Secretary for Resources
The Resources Agency
Sacramento, California

Dear Mr. Livermore:

I am submitting to you for presentation to Governor Ronald Reagan the Sixty-Fourth Report of the State Geologist and Chief, California Division of Mines and Geology, Wesley G. Bruer, for the fiscal year 1970-71.

I think you will be pleased to note the progress of the Division. It has accomplished its immediate objectives on time, with results we can all be proud of, and has shown the capability of responding to crises quickly, energetically, and well.

Respectfully,

James G. Stearns, Director

CONSERVATION IS WISE USE—KEEP CALIFORNIA GREEN AND GOLDEN

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MISSION AND OBJECTIVES OF THE CALIFORNIA DIVISION OF MINES AND GEOLOGY

The objective of the Division is to meet the geologic and mineral resources needs of California on a priority basis in cooperation with other public agencies and the private sector.

More formally stated, the mission of the Division is to collect, develop, and disseminate geologic information and actively encourage the application of a broad, useful understanding of the geology of California in cooperation with other agencies and the private sector; to thereby advise and assist in the wise management of the earth's crust, including its terrain and its mineral resources, as a service to the safety, economy, and enjoyment of the people of the State.

In so doing, it is the further objective of this Division to establish and maintain the standard of excellence for similar organizations throughout the world.

Statutory Authority

The Division operates under the authorities set forth in Chapter 2 of Division 1 and Chapters 1 and 2 of Division 2 of the Public Resources Code. The significant sections are summarized here:

Section	Substance of Law
601, 607	Establishes Department of Conservation in the Resources Agency, and Division of Mines and Geology and three other Divisions in the Department of Conservation.
660-667	Establishes State Mining and Geology Board and its responsibilities.
680	Establishes State Geologist as Chief of Division.
2201	State Geologist shall employ geologists and qualified specialists to do Division's work.
2203	State Geologist shall submit an annual report.
2204	State Geologist may receive and manage gifts on behalf of State.
2205	State Geologist may: Study mineral resources, mineral industries, and geology of the state. Collect mineral statistics.

Section	Substance of Law
2205	Collect geological and mineralogical specimens and models to constitute Division's exhibits.
	Provide technical library to be Division's library.
	Maintain, in effect, a bureau of information on the state's mineral industries.
	Conduct studies of geologic hazards in urban areas, including activities under cooperative agreements.
	Maintain a laboratory to perform physical and chemical tests and analyses.
	Issue reports and maps on the geology of the state and the statistics and technology of the state's mineral industries.

State Mining and Geology Board

This Board, which is within the Department of Conservation, consists of nine members, seven of whom are "associated with or having broad knowledge of the mineral industries of this state, of its geologic resources, or of related technical and scientific fields..." and two of whom shall be members of the public having an interest in and knowledge of the environment.

The Public Resources Code states that "The Board shall represent the State's interest in the development, utilization, and conservation of the mineral resources of the state and in the development, collection, collation, and dissemination of geological information necessary to the understanding and utilization of the state's terrain and information pertaining to earthquake and other geologic hazards. It may establish policies conforming to the provisions of State statutes to govern the administration of the Division of Mines and Geology." The Board reviews Division policies and programs from time to time at its meetings.

The State Geologist, who serves as Chief of the Division, is "appointed under provisions of the State Civil Service Act by the Director (of the Department of Conservation) upon nomination by the Board."

Mr. Edmond F. Brovelli was appointed Chairman, Dr. Richard H. Jahns, Vice Chairman, and Mr. Karl V. Steinbrugge, Secretary of the Board. Three new members were appointed to the Board by Governor Reagan. They are Joseph E. Haring of Pasadena, J. Wilmar Jensen of Modesto, and Eugene F. Reid of Bakersfield. Mr. Reid succeeded T. Howard Rodgers, who resigned, while Dr. Haring and Mr. Jensen represent the public as established by legislation in 1970.

The Board met on:

September 22, 1970	San Francisco
December 8, 1970	Sacramento
January 12, 1971	Los Angeles
March 9, 1971	Los Angeles
June 8, 1971	Sacramento

During the 1970-71 fiscal year, the Board:

welcomed Wesley G. Bruer as permanent Chief of the Division;

reviewed the policies and goals of the Division;

passed a motion requiring that all official records of the Board, including a master set of minutes, be kept in the headquarters office and that copies be sent to the Division Library in San Francisco and the University of California Library in Berkeley;

reviewed effects of the San Fernando earthquake and visited the areas affected by it;

reviewed the various County cooperative programs and the Division's Geodimeter program;

reviewed the report of the California Committee on Surface Mining;

prepared a recommended mining and minerals policy for California.

Mining and Geology Board Members

	Current Term*	First Appointed
EDMOND F. BROVELLI, Chairman President, Basalt Rock Company Post Office Box 2540 Napa 94558	1971-75	1962
DR. CLARENCE R. ALLEN Seismological Laboratory California Institute of Technology Post Office Bin 2--Arroyo Annex Pasadena 91109	1969-73	1969
PHILIP R. BRADLEY 2801 Oak Knoll Terrace Berkeley 94705	1968-72	1943
DR. JOSEPH E. HARING Economics Department Occidental College Los Angeles 90041	1971-75	1971
DR. PAUL C. HENSHAW Homestake Mining Company 650 California Street San Francisco 94108	1968-72	1968
DR. RICHARD H. JAHNS, Vice Chairman School of Earth Sciences Stanford University Stanford 94305	1970-74	1966
J. WILMAR JENSEN (Three-year term) Jensen & Pendergrass 1514 H Street Modesto 95354	1971-74	1971
EUGENE R. REID Occidental Petroleum Corp. 5000 Stockdale Highway Bakersfield 93309	1971-75	1971
T. HOWARD RODGERS Chanslor-Western Oil and Development Company 4549 Produce Plaza Los Angeles 90058 (Resigned effective November 1, 1970)	1967-71	1959
KARL V. STEINBRUGGE, Secretary Pacific Fire Rating Bureau 465 California Street San Francisco 94104	1969-73	1969

*Terms of members as set forth in California Public Resources Code, Division 1, Chapter 2, Section 662.

ADMINISTRATION AND ORGANIZATION

Basic reorganization of the Division was accomplished in fiscal year 1969-70: Fiscal year 1970-71 saw the implementation of that reorganization. The headquarters of the Division was officially transferred in fiscal year 1969-70; the physical move was completed in 1970-71. Portions of the Division moved were the Administration, Program, and Geologic Data Groups. The Geophysical Section was also consolidated in Sacramento. Chief Wesley G. Bruer assumed the additional duties of State Oil and Gas Supervisor on April 15, 1971.

Although the Division's effort was carefully programmed, flexibility in organization and administration was demonstrated by the immediate response of Division personnel to the large-scale emergency created by the San Fernando earthquake. Increased public awareness of geology was indicated by the sell-out of the Los Angeles sheet of the Geologic Map of California in little more than six months.

Flexibility was further tested immediately by a "crash" program for the Federal Insurance Administration in carrying out a pilot project on mudslide risk zone delineation in Ventura County. Although the start of this project was delayed ten days by the earthquake, the Division delivered on schedule a product which may well become a standard reference for landslide studies for many years to come.

Greater emphasis was placed on seismic studies with the addition of a seismologist and a third geophysicist (specializing in geodesy) to the staff. The Marine Geology staff also grew modestly. District Offices became more self-sufficient with the addition of a resident draftsman to the staff in both San Francisco and Los Angeles. The Library staff added specialized expertise with the reclassification of a Clerk position to Library Technical Assistant.

APPROVED

N. B. Livermore Jr.

SECRETARY FOR RESOURCES

August 20, 1970

STATE OF CALIFORNIA

THE RESOURCES AGENCY

AUGUST 1970

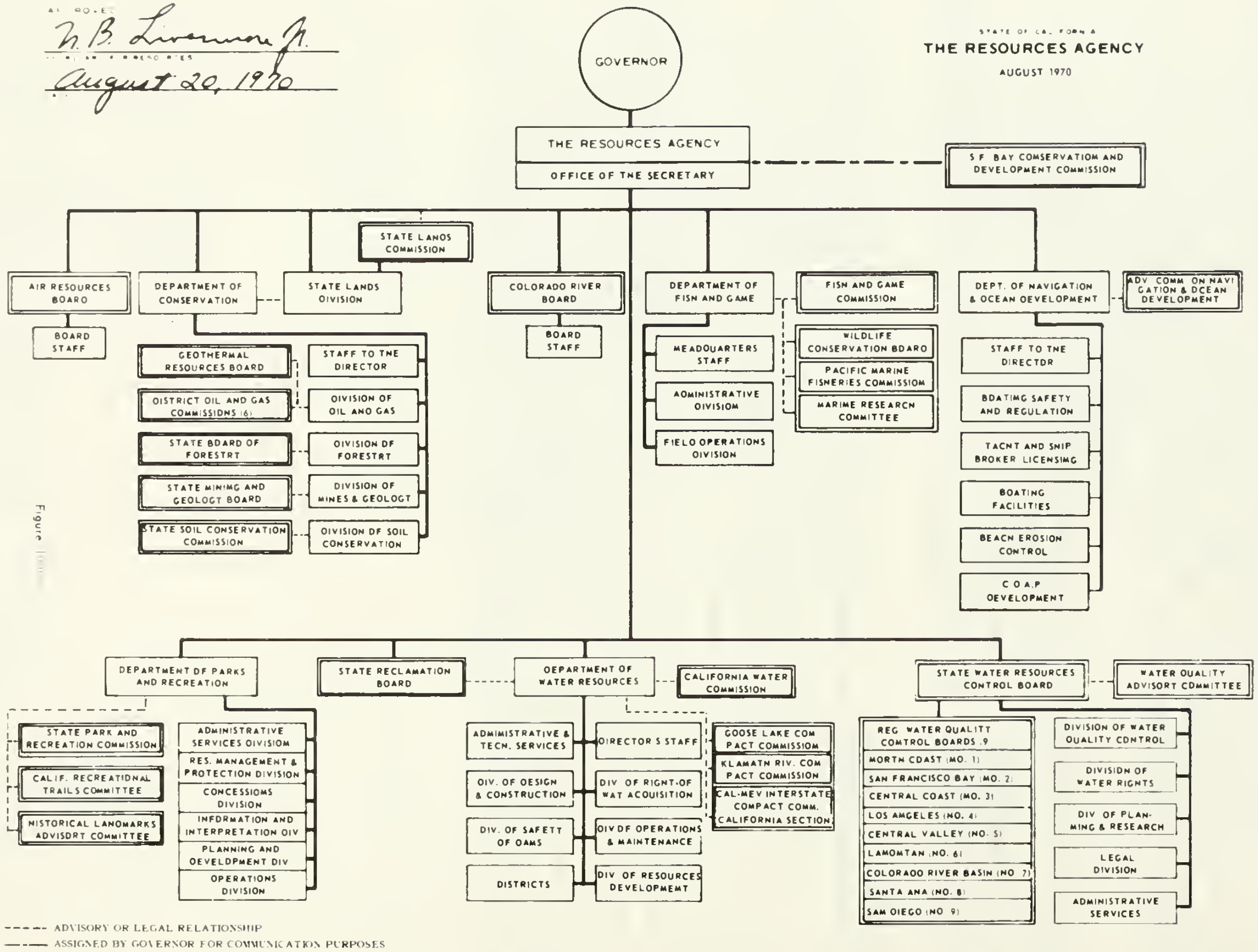

GOVERNOR
THE RESOURCES AGENCY
OFFICE OF THE SECRETARY
S F BAY CONSERVATION AND DEVELOPMENT COMMISSION
AIR RESOURCES BOARD
BOARD STAFF
DEPARTMENT OF CONSERVATION
STATE LANDS DIVISION
STATE LANDS COMMISSION
GEOTHERMAL RESOURCES BOARD
DISTRICT OIL AND GAS COMMISSIONS (6)
STATE BOARD OF FORESTRY
STATE MINING AND GEOLOGY BOARD
STATE SOIL CONSERVATION COMMISSION
STAFF TO THE DIRECTOR
DIVISION OF OIL AND GAS
DIVISION OF FORESTRY
DIVISION OF MINES & GEOLOGY
DIVISION OF SOIL CONSERVATION
COLORADO RIVER BOARD
BOARD STAFF
DEPARTMENT OF FISH AND GAME
HEADQUARTERS STAFF
ADMINISTRATIVE DIVISION
FIELD OPERATIONS DIVISION
FISH AND GAME COMMISSION
WILDLIFE CONSERVATION BOARD
PACIFIC MARINE FISHERIES COMMISSION
MARINE RESEARCH COMMITTEE
DEPT. OF NAVIGATION & OCEAN DEVELOPMENT
ADV. COMM. ON NAVIGATION & OCEAN DEVELOPMENT
STAFF TO THE DIRECTOR
BOATING SAFETY AND REGULATION
YACHT AND SHIP BROKER LICENSING
BOATING FACILITIES
BEACH EROSION CONTROL
C.O.A.P. DEVELOPMENT
DEPARTMENT OF PARKS AND RECREATION
STATE PARK AND RECREATION COMMISSION
CALIF. RECREATIONAL TRAILS COMMITTEE
HISTORICAL LANDMARKS ADVISORY COMMITTEE
ADMINISTRATIVE SERVICES DIVISION
RES. MANAGEMENT & PROTECTION DIVISION
CONCESSIONS DIVISION
INFORMATION AND INTERPRETATION DIV
PLANNING AND DEVELOPMENT DIV
OPERATIONS DIVISION
STATE RECLAMATION BOARD
DEPARTMENT OF WATER RESOURCES
CALIFORNIA WATER COMMISSION
ADMINISTRATIVE & TECH. SERVICES
DIV. OF DESIGN & CONSTRUCTION
DIV. OF SAFETY OF DAMS
DISTRICTS
DIRECTOR'S STAFF
DIV. OF RIGHT-OF-WAY ACQUISITION
DIV OF OPERATIONS & MAINTENANCE
DIV. OF RESOURCES DEVELOPMENT
GOOSE LAKE COM PACT COMMISSION
KLAMATH RIV. COM PACT COMMISSION
CAL-NEV INTERSTATE COMPACT COMM. CALIFORNIA SECTION
STATE WATER RESOURCES CONTROL BOARD
WATER QUALITY ADVISORY COMMITTEE
REG. WATER QUALITY CONTROL BOARDS, 9
NORTH COAST (NO. 1)
SAN FRANCISCO BAY (NO. 2)
CENTRAL COAST (NO. 3)
LOS ANGELES (NO. 4)
CENTRAL VALLEY (NO. 5)
LAHONTAN (NO. 6)
COLORADO RIVER BASIN (NO. 7)
SANTA ANA (NO. 8)
SAN DIEGO (NO. 9)
DIVISION OF WATER QUALITY CONTROL
DIVISION OF WATER RIGHTS
DIV. OF PLANNING & RESEARCH
LEGAL DIVISION
ADMINISTRATIVE SERVICES
----- ADVISORY OR LEGAL RELATIONSHIP
—·— ASSIGNED BY GOVERNOR FOR COMMUNICATION PURPOSES

Figure [illegible]

ALIFORNIA DIVISION OF
MINES AND GEOLOGY

DIVISION HEADQUARTER
RESOURCES BUILDIN
ROOM 13
1416 NINTH STREE
SACRAMENTO CA 958

SEPTEMBER 27, 1971

Dear Sir:

Enclosed for your information is the Sixty-Fourth Annual Report of the State Geologist summarizing the work of the California Division of Mines and Geology during fiscal year 1970-71.

As you may know, in endeavoring to meet the changing geologic priorities of California, the Division has increasingly emphasized activities in the area of geologic hazards, such as earthquakes and landslides, while continuing to maintain its historic role in the mineral resources field. A significant part of the Division's work is conducted cooperatively with local governmental agencies.

We hope you will continue your interest in the Division. Your comments on our programs will be appreciated.

Very truly,

Wesley G Bruer

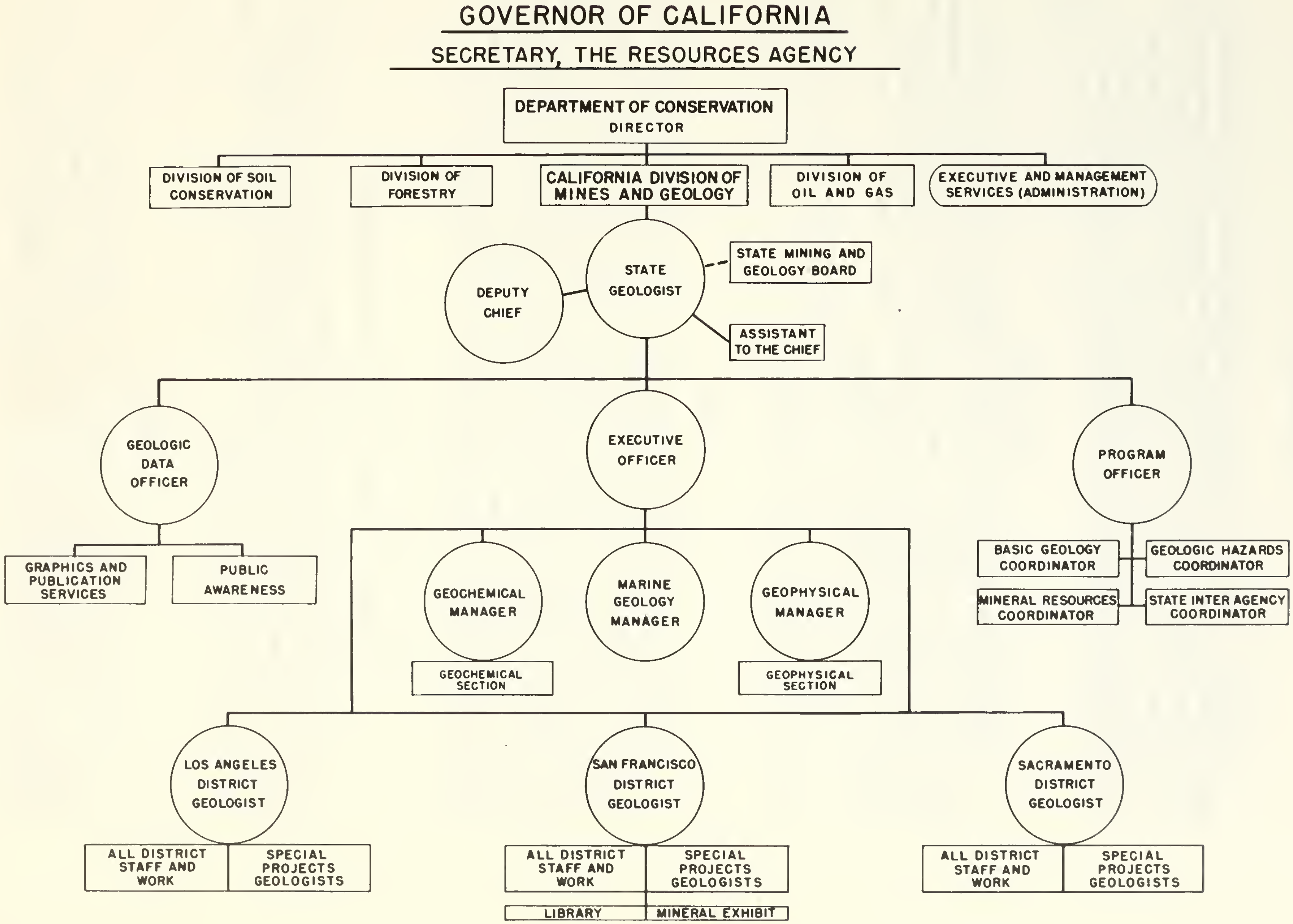
Wesley G. Bruer
State Geologist

dress mail orders to the California Division of Mines and Geology, Post Office Box 2980, Sacramento, California 95812. Checks and Money Orders shoul
payable to the California Division of Mines and Geology. Please do not send stamps in payment. Publications may be purchased over-the-counter at the t
ct Offices: Sacramento, Room 118, Resources Building, 1416 Ninth Street; San Francisco, Room 2022, Ferry Building; Los Angeles, Room 1065, Juni
Building, 107 South Broadway.

ORGANIZATION

CALIFORNIA DIVISION OF MINES AND GEOLOGY

JUNE 30, 1970


GOVERNOR OF CALIFORNIA
SECRETARY, THE RESOURCES AGENCY
DEPARTMENT OF CONSERVATION DIRECTOR
DIVISION OF SOIL CONSERVATION
DIVISION OF FORESTRY
CALIFORNIA DIVISION OF MINES AND GEOLOGY
DIVISION OF OIL AND GAS
EXECUTIVE AND MANAGEMENT SERVICES (ADMINISTRATION)
DEPUTY CHIEF
STATE GEOLOGIST
STATE MINING AND GEOLOGY BOARD
ASSISTANT TO THE CHIEF
GEOLOGIC DATA OFFICER
EXECUTIVE OFFICER
PROGRAM OFFICER
GRAPHICS AND PUBLICATION SERVICES
PUBLIC AWARENESS
GEOCHEMICAL MANAGER
MARINE GEOLOGY MANAGER
GEOPHYSICAL MANAGER
GEOCHEMICAL SECTION
GEOPHYSICAL SECTION
BASIC GEOLOGY COORDINATOR
GEOLOGIC HAZARDS COORDINATOR
MINERAL RESOURCES COORDINATOR
STATE INTER AGENCY COORDINATOR
LOS ANGELES DISTRICT GEOLOGIST
SAN FRANCISCO DISTRICT GEOLOGIST
SACRAMENTO DISTRICT GEOLOGIST
ALL DISTRICT STAFF AND WORK
SPECIAL PROJECTS GEOLOGISTS
ALL DISTRICT STAFF AND WORK
SPECIAL PROJECTS GEOLOGISTS
LIBRARY
MINERAL EXHIBIT
ALL DISTRICT STAFF AND WORK
SPECIAL PROJECTS GEOLOGISTS

PERSONNEL

Wesley G. Bruer was appointed permanent State Geologist and Chief, California Division of Mines and Geology. He is assisted by the Deputy Chief, the Executive Officer, the Program Officer, and the Geologic Data Officer. In addition, there are 36 geologists, 1 geochemist, 2 geophysicists, 1 seismologist, 1 marine geologist, and 34 supporting technical, editorial, and clerical personnel.

Transferred

From San Francisco to Sacramento--Quintin A. Aune, Assistant Geologist; John L. Burnett, Associate Geologist; Rodger H. Chapman, Senior Geologist; Marilyn F. Dayton, Stenographer II; Raymond Grimm, Delineator; Mary R. Hill, Senior Geologist; R. Merl Smith, Supervising Geological Draftsman; Rudolph G. Strand, Associate Geologist; Jeffrey O. Tambert, Geological Draftsman.

From Los Angeles to newly opened field office in San Luis Obispo, George B. Cleveland, Senior Geologist.

Hired

Charles F. Armstrong, Geologic Aid; C. Forrest Bacon, Assistant Geologist; Trinda L. Bedrossian, Geologic Aid; John H. Bennett, Associate Geophysicist; Richard Boylan, Delineator; Patrick Caldwell, Geologic Aid; Gordon W. Chase, Associate Geophysicist; James R. Evans, Associate Geologist; Alexander Eng, Drafting Aid; Dorothy Fong, Drafting Aid; Edward L. Foster, Geological Draftsman; Rodger W. Greensfelder, Associate Seismologist; Susan K. Intfen, Clerk-Typist; Bert Jeffries, Geologic Aid; Ronald Morgan, Graphic Artist; Mary E. Roche, Library Technical Assistant I; Constance Stephens, Clerk-Typist; and John W. Williams, Junior Geologist.

Resigned or Transferred to Other Agencies

Paul L. Anderson, Associate Geochemist; Margaret Beck, Clerk II; Donald B. Eisman, Research Writer; Jerrie Gasch, Associate Geophysicist; Harold B. Goldman, Senior Geologist; Evelyn Rose, Clerk-Typist; Arthur R. Smith, Associate Geologist; Constance Stephens, Clerk-Typist; and Lorraine Yim, Graphic Artist.

Promoted

Cliffton H. Gray, Jr., Mary R. Hill, James B. Koenig, and Rudolph G. Strand to Senior Geologist; Allan G. Barrows to Assistant Geologist; Eleanor M. Learned to Senior Information Clerk; Josephine M. Territo to Senior Stenographer; Margaret W. Turner to Stenographer II.

Temporary Employees

The Division has participated in the various federally and State funded student aid programs throughout the year. At one time or other, three College Work-Study students and two Neighborhood Youth Corps students have been utilized.

In addition, high priority federally funded studies conducted by our Los Angeles District necessitated the employment of three Junior Geologists, one Drafting Aid II, and one Geologic Aid for a period of two months or less.

One Government Intern was employed in the San Francisco District for less than one month to fill a gap in the College Work-Study program.

GEOLOGIC HAZARDS AND
MINERAL RESOURCES CONSERVATION PROGRAM

Geologic Hazards Element

The Geologic Hazards Element develops data on the geologic environment in the interest of public safety. Particular attention is paid to those areas being considered for urban development so that public agencies and private planners, developers, and builders will be aware of the geologic conditions which must be taken into account, including existing and potential hazards such as landslides, active faults, rapid erosion, and subsidence. Assistance--in the form of cooperative agreements which include sharing costs with local governmental agencies, other State agencies, and Federal agencies--enables the Division to work on a far broader front than would otherwise be possible. This is discussed in greater detail in the section on Cooperative Activities.

Three categories are included in this part of the program: Geologic Data Gathering and Dissemination; Special Problems in Environmental Geology; and Seismic and Fault Movement Investigations.

Geologic Data Gathering and Dissemination, Urban Mapping Projects Active During FY 1970-71

Area	Staff	Progress
City of San Diego, San Diego County	Kennedy	Mapping compiled for open file
Lake Tahoe Basin, Placer and El Dorado Counties	Burnett, Matthews	Final report rewritten
*Sonoma Mountain, Sonoma County	Huffman	Completed maps and report for 2 areas
*Hayward Hills, City of Hayward	Burnett	Revised for inclusion in planning report
*Santa Cruz Mountains, Santa Clara County	Rogers	Map and report completed of selected areas
*Various areas in Marin County	Rice, Strand	Maps and reports completed of 3 areas
Part of Carquinez quadrangle, Solano County	Bacon, Hauge	2 maps completed; reports underway
*South half, Ventura County	Weber, Mills	Maps being compiled

*Cooperatively supported venture

7½ Minute Quadrangles	Staff	Progress
*West central Mt. Wilson, Los Angeles County	Saul	Report completed
*East central Mt. Wilson and S½ Azusa, Los Angeles County	D.Morton	Continued processing for publication
*SE¼ Mint Canyon, Los Angeles County	Saul, Wootton	Mapping continued
SW¼ Walnut Creek, Contra Costa County	Saul	Continued processing for publication
SW¼ San Rafael, Marin County	Rice	Mapping continued
NW¼ Folsom, Sacramento Co.	Aune	Mapping commenced
*S½ Mt. Baldy and SW¼ Glendora, Los Angeles Co.	Streitz	Map and report completed
*SE¼ Oat Mountain, Los Angeles County	Saul	Mapping completed
*SW¼ Oat Mountain, Los Angeles County	Evans	Mapping commenced
Thousand Oaks, Ventura Co.	Weber	Mapping continued
*Calabasas, Los Angeles Co.	Weber	Mapping continued
*Cañada Gobernadora, Orange County	P.Morton	Final compilation underway
*S½ El Toro, Orange County	Fife	Report completed
*Dana Point, Orange County	Edgington	Report completed
*San Juan Capistrano, Orange County	P.Morton Edgington Fife	Mapping completed

*Cooperatively supported

GEOLOGIC HAZARDS AND MINERAL RESOURCES CONSERVATION PROGRAM

Geologic Hazards Element

The Geologic Hazards Element develops data on the geologic environment in the interest of public safety. Particular attention is paid to those areas being considered for urban development so that public agencies and private planners, developers, and builders will be aware of the geologic conditions which must be taken into account, including existing and potential hazards such as landslides, active faults, rapid erosion, and subsidence. Assistance--in the form of cooperative agreements which include sharing costs with local governmental agencies, other State agencies, and Federal agencies--enables the Division to work on a far broader front than would otherwise be possible. This is discussed in greater detail in the section on Cooperative Activities.

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*Santa Cruz Mountains, Santa Clara County	Rogers	Map and report completed of selected areas
*Various areas in Marin County	Rice, Strand	Maps and reports completed of 3 areas
Part of Carquinez quadrangle, Solano County	Bacon, Hauge	2 maps completed; reports underway
*South half, Ventura County	Weber, Mills	Maps being compiled

*Cooperatively supported venture

$7\frac{1}{2}$ Minute Quadrangles	Staff	Progress
*West central Mt. Wilson, Los Angeles County	Saul	Report completed
*East central Mt. Wilson and S½ Azusa, Los Angeles County	D.Morton	Continued processing for publication
*SE¼ Mint Canyon, Los Angeles County	Saul, Wootton	Mapping continued
SW¼ Walnut Creek, Contra Costa County	Saul	Continued processing for publication
SW¼ San Rafael, Marin County	Rice	Mapping continued
NW¼ Folsom, Sacramento Co.	Aune	Mapping commenced
*S½ Mt. Baldy and SW¼ Glendora, Los Angeles Co.	Streitz	Map and report completed
*SE¼ Oat Mountain, Los Angeles County	Saul	Mapping completed
*SW¼ Oat Mountain, Los Angeles County	Evans	Mapping commenced
Thousand Oaks, Ventura Co.	Weber	Mapping continued
*Calabasas, Los Angeles Co.	Weber	Mapping continued
*Cañada Gobernadora, Orange County	P.Morton	Final compilation underway
*S½ El Toro, Orange County	Fife	Report completed
*Dana Point, Orange County	Edgington	Report completed
*San Juan Capistrano, Orange County	P.Morton Edgington Fife	Mapping completed

*Cooperatively supported

Special Problems in Environmental Geology, Projects Active During FY 1970-71

Project	Staff	Progress
Wrightwood mudflows	D.Morton	Report completed
Wright Mountain landslide	D.Morton	Report revised
Landsliding in coastal regions of California	Cleveland	Field and office work continued
Erosion of Sunset Cliffs, San Diego County	Kennedy	Revised open file map and prepared report
Quality requirements for mine waste water, under Porter-Cologne Act, 1969, A review	Davis Streitz	Text revised
*U.S. Department of Housing and Urban Development (HUD) --California master plan for urban geology	Staff	Project initiated; basic data gathered
*HUD--Analysis of mudslide risk in southern Ventura County	Staff	Completed for HUD (Federal Insurance Administration)
*HUD--Regional landslide prediction	Cleveland	Completed for HUD (Federal Insurance Administration)
*Volcanic hazards	Chesterman	Map at scale of 1:1,000,000 describing past and future activity; completed for HUD (master plan)
Thermal power plant siting	Koenig	Participated in various site evaluations
*Real estate tract reviews	Kelley	For the Department of Real Estate (under contract)
San Fernando earthquake	Oakeshott et al	Bulletin commenced

*Cooperatively supported venture

Seismic and Fault Movement Investigations

Project	Staff	Progress
Active faults, statewide	Kahle	Preliminary data compiled on base maps
Elsinore fault, active breaks	Barrows	Photo interpretation of northern section
San Andreas fault, San Bernardino area	D.Morton	Continued field work; mapping of Devore 7½' quadrangle completed.
*Calaveras fault, Hollister	Bishop, Rogers	Continued creep measurements; prepared progress report.
*Newport-Inglewood fault zone	Barrows	Preliminary report revised
Earthquake damage analysis	Bishop, Hill, Kahle, Rogers	Made on-site investigations of several earthquakes
*San Fernando earthquake	Staff	Published in special issue of California Geology
*Geodimeter program	Bennett, Greensfelder	Continued field measurements; began evaluation of data.
Tiltmeter program	Bennett, Greensfelder	3 tiltmeters being modified; installation sites selected.
Crustal strain investigations	Greensfelder	In progress; map showing location of crustal strain activities
*Preliminary earthquake intensity zone map	Greensfelder	First draft of preliminary map showing expectable earthquake intensity zones in California submitted to Office of Emergency Services; to be revised.

*Cooperatively supported venture

Project	Staff	Progress
Lake Tahoe seismicity study	Greensfelder	Report prepared and submitted
Seismicity of coastal zone	Greensfelder	Report prepared and submitted to Department of Navigation and Ocean Development
*Active and Quaternary faults	Staff	Map and report prepared for HUD (master plan)

*Cooperatively supported venture

Basic Geology Element

The Basic Geology Element is designed to determine the general geologic framework of California, the properties of crustal materials, geologic processes responsible for the distribution and configuration of various rock units and mineral resources, and the geologic processes responsible for the seismic adjustment of various rock units.

Areal Geology Projects

Project	Staff	Progress
Lakeview-Perris quadrangles	D.Morton	Processed for publication
NE Shoshone quadrangle	Chesterman	Submitted for review
Haiwee Reservoir quadrangle	Stinson	Revised for publication
Keeler quadrangle	Stinson	Completed map compilation
Bodie quadrangle	Chesterman, Gray	Being reviewed
Structural geology of the southern Mother Lode area	Evans	Map and report being revised
Mescal Range quadrangle	Evans	Processed for publication
San Luis Obispo area	Hart	Continued field work
Matterhorn Peak quadrangle	Chesterman	Being reviewed
N½ Confidence Hills quadrangle	Troxel, Wright*	Revived field map
Big Dune-Chloride Cliff quadrangles	Troxel, Wright*	Compiled field map
S½ Chittenden-N½ San Juan Bautista quadrangles	Bishop	Field work continued; processed gravity data
Upper Cretaceous, SW San Joaquin Valley	Bishop	Processed for publication

*Former staff geologist, now at Penn State

Geologic Maps

Project	Staff	Progress
Death Valley sheet revision	Streitz	Continued compilation; 50 percent completed
Los Angeles sheet	Jennings, Strand	Released
Geologic legend and formation indexes	Jennings	Released
State geologic planning map 1:750,000	Burnett, Jennings, Stinson, Streitz	Continued compilation
Index to geologic mapping 1969	Kiessling	Compilation completed
Index to geologic mapping 1970	Kiessling	Compilation commenced

Geophysical Projects (other than seismic and fault investigations)

Project	Staff	Progress
Bouguer Gravity Map of California (1:250,000)	Chapman, staff	Kingman, Redding, Santa Rosa sheets submitted for publication; all remaining sheets in preparation.
Bouguer Gravity Map of California (1:750,000)	Chapman, staff	Approximately 50% completed
Ione geophysical study	Bishop, Chapman	Report being reviewed
Port Wine area study	Chapman, Clark	Completed interpretation of data; report in progress
Aeromagnetic map of California (1:750,000)	Chase	Began compilation of available data
Orange County geophysics	Chase	Seismic investigations of landslides in Orange County completed
Bodie Hills gravity	Chapman	Report prepared on gravity anomalies in Bodie Hills area and submitted to the U.S. Geological Survey

Geochemical Projects

The primary mission of the geochemical laboratory is to provide geochemical support to other Division activities. In addition to projects listed below, the laboratory provided technical service for a wide variety of Division projects

Project	Staff	Progress
*Relationship of geochemistry to health	Anderson	Prepared for HUD (Master Plan); submitted for publication in California Geology
X-ray spectroscopic rock analysis	Anderson, staff	Developed major and minor element analytical system
Physical testing of soil samples	Anderson, Majmundar, staff	Devised physical tests on sedimentary materials (particle size distribution and Atterberg tests); bulk and clay mineralogy determined by x-ray diffraction.
Differential thermal analysis	Anderson, Majmundar, staff	Developed procedure to identify various clays
Colorimetric analysis of silica and alumina	Majmundar, staff	Work in progress for development of analytical procedure
Titrimetric analysis of ferrous and ferric iron concentration	Majmundar, staff	Developed analytical procedure
Mineral separation for potassium-argon age determinations	Majmundar, staff	Developed time-saving system for the separation of biotite from other minerals
Atomic absorption and emission analysis of magnesium, sodium, and potassium	Majmundar, staff	Developed analytical procedure
Atomic absorption analysis of copper, lead, and zinc	Majmundar, staff	Developed analytical procedure

Project	Staff	Progress
Atomic absorption analysis of gold and silver	Majmundar, staff	Work in progress for development of analytical procedure
Flameless atomic absorption analysis of mercury	Majmundar, staff	Work in progress

*Cooperatively supported venture

Mineral Resources Element

The Mineral Resources Element provides information on the mineral resources of California in the interests of the people of the state. The Division assists in meeting mineral resources demands by planned investigation and delineation of new mineral deposits and by development of more efficient field and laboratory techniques. In addition to the principal active projects listed here, the Division has been involved in studies concerning factors which affect mineral production in California, such as mine waste-water discharge, mine and mill waste for construction use, and legislation relevant to land use problems and the wise development of the state's mineral resources.

County Mineral Resource Investigations

Project	Staff	Progress
Riverside	Saul, Evans, Gray	Revised and being reviewed
Imperial	P.Morton	Processed for publication
Sutter	Kiessling	Processed for open file
Alpine	Clark	Being reviewed

Commodity Investigations

Project	Staff	Progress
Limestone and dolomite resources of California	Bowen, staff	In press as Bulletin 194
Limestone, dolomite, and shell resources in the Coast Ranges province	Hart	In review
Limestone and dolomite resources of the Klamath Mountains province	Evans	In review
Mother Lode guidebook revision Bulletin 141	Clark, Hill	In progress
Simi conglomerate as source of concrete aggregate, Los Angeles	Kiessling	Map and report reviewed and revised
Silver, Calico silver district	Weber	Continued field and office work

Project	Staff	Progress
Mine wastes as source of aggregates, north foothills Sierra Nevada	Clark	Field work completed; report prepared
*San Francisco Bay Area minerals study	Burnett, Chesterman, Stewart, Stinson, Welday	Initiated field work (by contract with USGS)
Silver, Bodie district	Chesterman, Gray	Completed field investigation; reports prepared
Economic potential of geothermal resources	D.Anderson,** Koenig	Report prepared for the report to the Legislature
Geologic setting of the Imperial Valley and its geothermal resources	Koenig	Prepared for Geothermal Resources Board
Geothermal exploration and the western United States	Koenig	Prepared for United Nations symposium on the development and utilization of geothermal resources

In addition, a group of four 1:1,000,000 scale maps and a report were prepared for HUD (Master Plan), showing the relationship of mineral deposits to geologic units throughout the state.

*Cooperatively supported venture

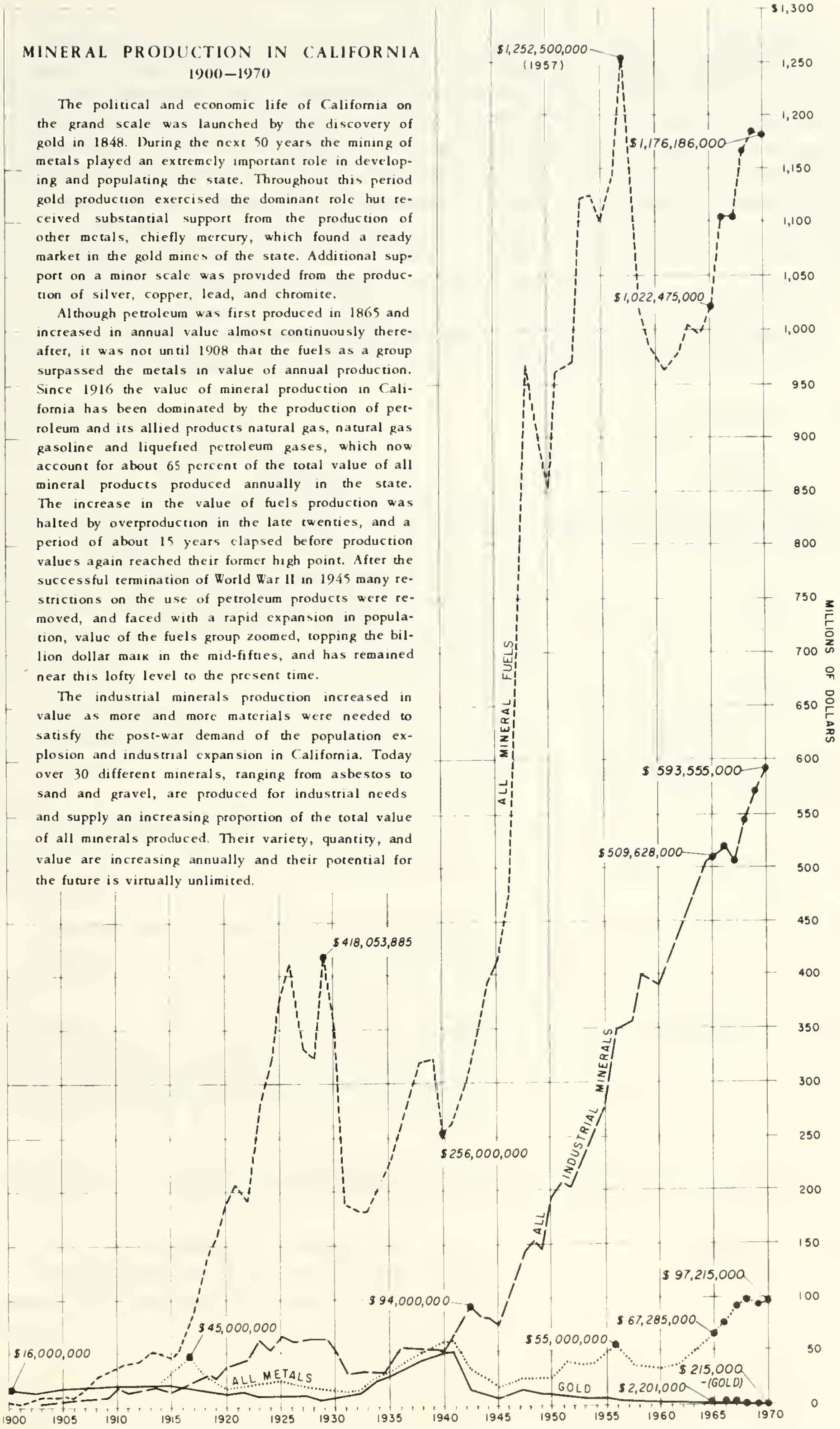
**Staff geologist, California Division of Oil and Gas

MINERAL PRODUCTION IN CALIFORNIA
1900—1970

The political and economic life of California on the grand scale was launched by the discovery of gold in 1848. During the next 50 years the mining of metals played an extremely important role in developing and populating the state. Throughout this period gold production exercised the dominant role but received substantial support from the production of other metals, chiefly mercury, which found a ready market in the gold mines of the state. Additional support on a minor scale was provided from the production of silver, copper, lead, and chromite.

Although petroleum was first produced in 1865 and increased in annual value almost continuously thereafter, it was not until 1908 that the fuels as a group surpassed the metals in value of annual production. Since 1916 the value of mineral production in California has been dominated by the production of petroleum and its allied products natural gas, natural gas gasoline and liquefied petroleum gases, which now account for about 65 percent of the total value of all mineral products produced annually in the state. The increase in the value of fuels production was halted by overproduction in the late twenties, and a period of about 15 years elapsed before production values again reached their former high point. After the successful termination of World War II in 1945 many restrictions on the use of petroleum products were removed, and faced with a rapid expansion in population, value of the fuels group zoomed, topping the billion dollar mark in the mid-fifties, and has remained near this lofty level to the present time.

The industrial minerals production increased in value as more and more materials were needed to satisfy the post-war demand of the population explosion and industrial expansion in California. Today over 30 different minerals, ranging from asbestos to sand and gravel, are produced for industrial needs and supply an increasing proportion of the total value of all minerals produced. Their variety, quantity, and value are increasing annually and their potential for the future is virtually unlimited.



Marine Geology Element

Although it has been treated separately for administrative purposes, this element is really the extension of Geologic Hazards, Basic Geology, and Mineral Resources elements into the marine environment. Fiscal year 1970-71 was the first year this element has had full-time staffing. The major effort has been to develop a comprehensive sea-floor lithologic map for the entire California coastal area. This has consisted primarily of compilation and interpretation of existing data. It is necessarily rudimentary in nature but, in addition to being useful itself, will be helpful as an indicator of areas needing further investigation.

Senior Marine Geologist Ed Welday was assisted half-time by Junior Geologist John Williams during the latter part of the year.

Marine Geology Projects

Project	Progress
*Surficial geology maps of offshore areas	Compilation and interpretation of bottom notations and soundings; preliminary maps from Oregon border to Pt. Conception completed; bathymetric maps south of Pt. Conception completed.
*Comprehensive Ocean Area Plan (For Department of Navigation and Ocean Development)	Chapter on geology, physiography, and mineral resources of coastal zone submitted in cooperation with State Lands Division.
*Bottom sediment characteristics of Russian River	Collected and characterized samples from Bridgehaven to mouth
*Surficial notations	Inspected and characterized beach, offshore, and bay samples obtained from other agencies
*Offshore cruises	Measured 100 miles of high-precision bathymetric profiling; prepared estimates of shell mining impact on environment and present shell reserves.
*Monitoring of sand miners in Monterey Bay	Received information on variation of sample characteristics
*Tsunami hazards	Report prepared for Comprehensive Ocean Area Plan; map prepared for California Urban Geology Master Plan.

*Cooperatively supported venture

Geologic Data Element

The objective of the Geologic Data Element is to provide the citizens of California with geologic information relevant to their lives and livelihoods. The Geologic Data staff compiles and disseminates the results of studies made by staff members of the California Division of Mines and Geology and others in the earth sciences profession. They do this in a variety of ways: by formal publications, by letter, by informal Notes, by technical and semi-technical illustrated talks, and by personal contact.

The Division maintains three Information Desks, one at each of the District Offices, and, in San Francisco, a Mineral Exhibit and a Library to help relate the importance of geology to the safety, welfare, and economy of California.

Information Activities

The California Division of Mines and Geology is one of the organizations in California from which a citizen can be assured an answer to earth science questions. The Geologic Data staff answer queries as completely as possible. The fiscal year 1970-71 brought a flood of questions on earthquakes in the wake of the San Fernando disaster. The combined April-May issue of California Geology, devoted to the preliminary results of scientific investigations of the earthquake by the Division staff, found a wide audience among the general public and various levels of government and private industry. In addition, the Geologic Data group updated a leaflet on faults and earthquakes and a list of sources of further information on California earthquakes and faults and prepared a list of Mineral Information Service (name of California Geology prior to 1971)pertinent articles--all in response to questions from the public.

Publications

The Geologic Data staff publishes and distributes the results of technical studies of California geology as promptly, concisely, attractively, and economically as practicable. The staff reviews the technical content of manuscripts, drafts illustrations, does cartography of the maps, processes the manuscript and map editorially, coordinates the printing and lithography, negotiates contracts, manages the printing budget, and supervises the distribution of the final printed report.

During fiscal year 1970-71, revenue from sale of Division publications reached $87,000--an all-time high.

Major Publications Released During FY 1970-71

Gold districts of California. Bulletin 193
Geology of the Elysian Park-Repetto Hills area, Los Angeles County. Special Report 101
Los Angeles sheet, Geologic Map of California, Olaf P. Jenkins Edition
Geology of the NE¼ and NW¼ Cañada Gobernadora quadrangle, Orange County. Preliminary Report 10
Geology of the Shadow Mountains and northern part of the Shadow Mountains Southeast quadrangles, western San Bernardino County. Preliminary Report 12
Geology of the San Andreas 15-minute quadrangle, Calaveras County. Bulletin 195
Geologic legend and formation indexes to the Olaf P. Jenkins Edition Geologic Map of California
Special earthquake edition. April-May 1971 California Geology

Publications Reprinted During FY 1970-71

Legal guide for California prospectors and miners. Third printing of the thirteenth edition, with Addendum.
Gold districts of California. Economic Mineral Map 8. This is Plate 1 from Bulletin 193; it was reprinted and released separately because of the great demand.
Point Reyes peninsula and San Andreas fault zone, Field Trip A; San Francisco peninsula, Field Trip B; Yosemite Valley and Sierra Nevada batholith, Field Trip F. From Bulletin 190

California Geology

The December 1970 issue of our monthly publication was the last to bear the name Mineral Information Service. With the January 1971 issue, the name is California Geology.

When Mineral Information Service appeared as a publication of the California Division of Mines some 23 years ago, both the Division and the publication were appropriately named. The Division's primary and historic mission was to encourage mining and the mineral industry; geology was one of the tools used to accomplish that mission.

In recent years, the usefulness of geology to the activities and works of Californians (in addition to mining and mines) has been increasingly emphasized in the programs of the Division. An early recognition of this redirection toward "people-oriented" geology was the change in name from "Division of Mines" to "Division of Mines and Geology" in 1961.

Mineral resources are and will continue to be a vital part of the Division's program. Nevertheless, the entire earth science field and California's needs therein must be the concern of the Division. This conclusion prompted State Geologist Wesley G. Bruer to change the name of the publication to California Geology.

During fiscal year 1970-71, the magazine circulated to an average of 13,344 paid subscribers, colleges, universities, and libraries each month.

Major articles appearing in Mineral Information Service-California Geology during the 1970-71 fiscal year are:

Geology of the Klamath Mountains. Reprinted from "Mineral Resources of California", Bulletin 191, with photographs added
A trip to Castle Crags
Glaciation in Mt. Shasta-Castle Crags
California's gold dredges
Ancient windblown terrains of central California
Geology of the Mojave Desert. Reprinted from "Mineral Resources of California" with photographs added
A guide to information on the geology of California
Peruvian earthquake of May 31, 1970
"Mt. Lassen is in eruption and there is no mistake about that" (Eye-witness geology)
Barrier beach--diary of a beach (Eye-witness geology)
The unique beach sand at Rodeo Cove
Mineral production in California 1969
Addendum to "Legal guide for California prospectors and miners"
The California State geological surveys
The California Division of Mines and Geology today
Water, water (Eye-witness geology: California's north coast floods of December 1964)
The mineral industry of California in 1970
San Fernando earthquake
  Seismologic and crustal movement investigations of the San Fernando earthquake
  The geologic setting
  San Andreas blamed for San Fernando 'quake
  Geologic surface effects of the San Fernando earthquake
  Seismically triggered landslides above San Fernando Valley
  Effects of the San Fernando earthquake in the Oat Mountain quadrangle
Urban geology plan begun
California's geologic atlas complete
Geodimeter fault movement investigations in California

CDMG Notes

A new genus of information pamphlet was begun in January 1971. Originated as an inexpensive and simple answer to frequently asked questions, each Note consists of a 1- to 4-page description of an aspect of the earth sciences of California. Numbered and color-coded, the categories are: goldenrod for mining and mineral resources; green for ecology of earth science matters; blue for geological hazards; yellow for tourists and hobbyists; pink for administrative matters.

71-1	Locating a placer mining claim (goldenrod)
71-2	Locating a lode mining claim (goldenrod)
71-3	Faults and earthquakes (blue)
71-4	Program objectives in the Department of Conservation (green)
71-5	Serpentine--California State Rock (pink)
71-6	Your CDMG mineral exhibit and library at San Francisco (pink)
71-7	Marketing of gold (goldenrod)

They are all printed on special "letterhead" paper with a strip at the bottom giving instructions on how to order our publications. Additionally, "Placer Claims" and "Lode Claims" describe the "Legal guide" and "Faults and earthquakes" and "Marketing of gold" have subscription blanks for California Geology at the bottom.

The Sixty-Third Report of the State Geologist and the Directory of Mineral Producers in California for 1969 were issued in processed form, and several reports were placed on open file.

COOPERATIVE ACTIVITIES

The Division conducts a number of projects in cooperation with local governments, other State agencies, and federal agencies. The projects are designed to meet the need for information about actual or potential areas of geologic hazard or for information about mineral resources. Some of the projects are conducted to demonstrate the need for, and usefulness of, geology to local government planning, building, and public works agencies. Other projects are conducted cooperatively in order to accelerate progress on existing Division projects or to enable the Division to begin projects sooner than otherwise could be done. Most of the cooperative activities are funded equally by the Division and the cooperating agency; however, other arrangements are occasionally made, depending upon the availability of funds and the relative urgency of the project to the Division and the cooperating agencies.

Cooperative Activities with Local Governments

City of Hayward

Although the formal agreement with the City of Hayward terminated in fiscal year 1969-70, the Division continued to provide geologic advice to the Planning Department on a limited basis. The geologic work conducted by the Division in fiscal 1969-70 is being used by the City as a basis for a development plan for the hills east of Hayward.

City of Hollister

The Division continued a monitoring program on the Calaveras fault which runs through the city. Movement of approximately one-half inch per year was detected.

Los Angeles County

The Department of the County Engineer and the Los Angeles County Flood Control District provide funds that are matched by the Division to carry on geologic studies on the rapidly urbanizing areas of the county. Detailed geologic mapping was continued in the Mint Canyon 7½ minute quadrangle, Saugus area; the south half of the Oat Mountain 7½ minute quadrangle, western San Fernando Valley area; and the Calabasas 7½ minute quadrangle, Thousand Oaks area. After the San Fernando earthquake on February 9, 1971, a significant portion of the work was diverted to the area affected by the earthquake.

Marin County

The Division completed a detailed geologic hazards appraisal of three areas selected by the County Planning and Public Works Departments. The results will be used by the County for general planning purposes. The report outlines problem areas which may be affected by landsliding, flooding, coastal erosion, and seismic damage.

Napa County

An economic geology study was completed as input for the conservation element of the Napa County general plan. It was recommended that seven mineral resource zones be established for the protection of unmined resources. The future production is expected to be from deposits of construction stone, salt, mercury, expansible shale, diatomite, perlite, and pumice. It was also suggested that a County Mineral Resource Committee be established to develop a mineral resources plan.

Orange County

The Department of Building and Safety, the Road Department, and the County Flood Control District provide funds that are matched by the Division to conduct detailed geologic mapping in the rapidly urbanizing areas of the County so that potential geologic hazards may be identified prior to development. In fiscal year 1970-71, field studies were continued in the San Juan Capistrano quadrangle.

Santa Clara County

A geologic study and slope stability evaluation were completed of a 55-square-mile area in the Santa Cruz Mountains southwest of Los Gatos. The project area includes the active trace of the San Andreas fault, as well as areas with potential landslide and flood problems. The report contained recommendations concerning future urban development, conservation of mineral resources, and detailed identification of geologic hazards.

Sonoma County

An analysis of the potential geologic hazards of two areas, one north of Santa Rosa and the other east of Cotati, was completed under terms of a cooperative agreement with the County and as an integral part of the County's general plan program under the Planning Department. The report and maps provide information on geologic hazards such as faults, seismic activity, landslides, expansive soils, and areas of poor water percolation as a guide to future land development.

Ventura County

An agreement was entered into with Ventura County to conduct a geological investigation of the south half of the county. The project is funded cooperatively by the U.S. Geological Survey, the County Department of Public Works and the Division; it is scheduled for completion in fiscal 1971-72.

Cooperative Activities with State Agencies

California State Polytechnic College

An agreement was entered into with Cal Poly to provide space for a Division Field Office in the San Luis Obispo area so that geologic investigations in the southern Coast Ranges could be conducted more effectively.

California Department of Real Estate

Under a continuing agreement, the Division reviews subdivision applications at the request of the Department of Real Estate and determines whether or not geologic conditions are such as to constitute a geologic hazard to the tract or structures thereon. A statement on geologic hazards is made where necessary, using information available in the Division's files and library. The statements become a part of the public reports provided to the first purchasers of lots in the subdivision.

California Department of Water Resources

Under terms of an interagency agreement, the Department of Water Resources excavated several trenches in three locations in the San Fernando area subsequent to the San Fernando earthquake to enable the Division to acquire needed data on surface effects of the earthquake which otherwise could not be obtained.

Another agreement was made whereby the Department of Water Resources lent three Pellissier mercury tube tiltmeters to the Division for three years. The tiltmeters are to be installed in the Hollister area after being modified to increase their sensitivity.

California Division of Oil and Gas

An interagency agreement was initiated and concluded during fiscal 1970-71 in which the Division of Oil and Gas provided this Division with services relative to geothermal resources. This involved, among other things, assistance to the Chief in his role as Secretary of the Geothermal Resources Board, liaison with local governments in areas of geothermal resources, field investigations, and the preparation of reports on geothermal matters.

Lake Tahoe Basin

The Division continued to attend hearings and to provide advice to various agencies in the Lake Tahoe area. A summary of the Division's findings relative to the geologic problems in the Lake Tahoe Basin was provided to the Tahoe Regional Planning Agency and the U.S. Forest Service at the end of the fiscal year.

California State Lands Division

The interagency agreement with State Lands was continued whereby marine geology services are provided to that agency. This agreement provides for partial funding of the marine geologist position in this Division. Services include special studies of marine geology in connection with problems before the State Lands Commission and, collection, preparation, and interpretation of coastal and offshore data available from private, university, and governmental sources.

California State Water Resources Control Board and Regional Water Quality Control Boards

The Division continued to provide advice to the State and Regional Boards and to conduct investigations relative to reduction of pollution from mines and mine dumps in the interest of conserving mineral resources compatibly with water quality standards.

University of California at Berkeley

The Seismological Station provided the Division with detailed information on California earthquakes under terms of a continuing agreement. The Division is notified by telephone of the location and magnitude of all California earthquakes larger than Magnitude 5 so that earthquake response teams may be deployed rapidly to evaluate potential geologic hazards in affected areas.

The University also cooperated in the Division's crustal strain studies by providing assistance in obtaining funds for monitoring the San Andreas fault network in the central Coast Ranges.

Other Cooperative Services

In addition to services to other State agencies furnished on a continuing basis, the Division provided a wide variety of short-term evaluations to other agencies upon request.

Cooperative Activities with Federal Agencies

U.S. Department of Housing and Urban Development

The California Urban Geology Master Plan Project was begun to develop an over-all plan for coping with geologic hazards in the urban areas of California. The plan is financed in part through a comprehensive planning grant from the Department of Housing and Urban Development, under the provisions of Section 701 of the Housing Act of 1968. The Division of Mines and Geology sent requests for proposals to qualified consulting firms and ultimately selected Woodward-Lundgren & Associates, Oakland, as the prime contractor. The city and regional planning firm of Livingston and Blayney was engaged as a subcontractor for urban development.

At the close of the fiscal year, a number of individual tasks had been completed under the Master Plan, including a work plan for the total study, collection of urban growth projections for California through the year 2000, identification of local and regional geologic problems, and the identification of those mineral resources needed for urban growth. The information was collected in reports and on maps at a scale of 1:1,000,000, or approximately 16 miles to the inch.

The California Urban Geology Master Plan Project to be completed in fiscal year 1971-72 will provide a framework from which the geologic problems of the state can be attacked in an orderly and effective fashion.

A study of mudslide hazards in Ventura County was also completed under a Federal grant from the Department of Housing and Urban Development. The results of the Ventura County Mudslide Project will be used by the Federal Insurance Administration to aid in developing the principles of relative mudslide risk for guidance in setting mudslide insurance rates.

A demonstration project for these purposes was centered on a 1,015-square-mile area in southern Ventura County. Maps were prepared on a scale of 1:24,000, or approximately ½ mile to the inch, with areas rated on a high, intermediate, and low risk scale of mudslide potential. In an accompanying report, factors which lead to mudsliding are analyzed and the use of these factors for mudslide risk zoning are described.

The report concluded that two-thirds of the study area was in a high risk zone; one-quarter was low or no risk; and the small remainder was in an intermediate risk zone.

U.S. Bureau of Mines

The long-standing cooperative agreement between the Bureau and the Division concerning the collection of statistics of annual mineral production continued. Mining activities information was exchanged. The Bureau provided the Division with U.S. Mineral Production and Demand Projections to the year 2000 and projections of mineral production in California to the year 2020.

U.S. Geological Survey

The cooperative agreement for investigation of geology in California initiated in 1946 was continued. Limited financial support was provided by the Division for U.S.G.S. personnel to investigate the most recently active breaks along the Garlock, Manix, Big Pine, Elsinore, Sierra, and other active faults of California.

The U.S.G.S. contributed funds to the Division to continue and expand the State program of strain measurements along the San Andreas fault system.

An agreement was entered into whereby the U.S.G.S. would contribute funds to a Division study of the geological hazards and mineral resources of Ventura County. The effort is to be expended primarily in fiscal year 1971-72.

An agreement was initiated whereby the Division over two fiscal years would provide the U.S.G.S. with mineral commodity information--including the location, past production, demand, economics, alternative sources of supply, transportation costs, economic impact, and problems with extraction and utilization--for the nine-county San Francisco Bay region.

Division and U.S.G.S. personnel continued to cooperate on studies of the Bodie Mining District.

Cooperative Activities with Other Agencies

California Institute of Technology

A cooperative agreement was entered into with the Seismological Laboratory whereby the Division provides funds toward the expense of performing services in connection with the recording and study of earthquakes in California. The Seismological Laboratory provides prompt notification by telephone to Division geologists in the Los Angeles District of the location and magnitude of all California earthquakes larger than Magnitude 4.5, thereby enabling the Division to respond more rapidly to emergencies caused by possibly damaging earthquakes. In addition, the Division was provided with a list of "instrumental" and "felt" information on California earthquakes from the beginning of the historical record.

New York State University at Albany

Work under the cooperative agreement initiated in fiscal year 1969-70, by which the Division was able to expedite the preparation and analysis of geochemical samples from an area of known copper mineralization in Plumas County, was completed during fiscal year 1970-71. More than 800 analyses for copper, lead, and zinc were made during the course of this work.

Other Cooperative Activities

The Division continued to cooperate with Federal, State, County, and City agencies, universities and colleges, private companies, and individuals without formal contracts or matching funds, often on an individual basis, by exchanging information on the geology and mineral resources of California. Many of the activities listed elsewhere in this Report have been materially assisted by such cooperation. Examples of some of these cooperative activities are given here:

The evaluation of remote sensing techniques in the Coso Hot Springs area has been the subject of a continuing cooperative effort with the U.S. Navy, U.S. Geological Survey, National Aeronautics and Space Administration, and the Division.

Access to libraries and in some instances office space has been provided to Division staff by various California universities and colleges including Pomona College and the University of California at Berkeley, Davis, Los Angeles, Riverside, and San Diego (Scripps Institution of Oceanography).

Long-standing cooperation with the California Academy of Sciences continued with the fabrication of instruments for the Division by the Academy and the preparation of mineral exhibits for the Academy. Senior Geological Scientist Charles W. Chesterman continued to serve as Honorary Curator of Minerals.

The Hancock Foundation of the University of Southern California, the National Science Foundation, the U.S. Marine Minerals Technology Center at Tiburon, the U.S. Geological Survey, and the California Department of Fish and Game cooperated in the continuing marine geology studies of the Division.

The Division continued to provide assistance to the California Department of Navigation and Ocean Development and the Interagency Council on Ocean Resources in the preparation of the California Comprehensive Ocean Area Plan.

The Division cooperated with the California Department of Parks and Recreation on several projects including an evaluation of the landslide problems in the Del Valle Reservoir area, an evaluation of the geological hazards at the proposed State Park at San Onofre Bluff, and advice concerning a geological exhibit at Oroville Dam.

Specialists engaged in using remote sensing techniques from NASA's Ames Research Center at Moffett Field and from the University of California at Berkeley contributed to a more effective proposal for geology and mineral resource evaluations of Earth Resources Technology Satellite, Skylab, and supporting aircraft data.

The Division continued to provide assistance on request to various State, Federal, and foreign law enforcement investigative agencies.

The Division cooperated with the California Division of Forestry in plotting the locations of mines in the Sierra Nevada that may constitute possible safety hazards to recreationists.

BUDGET SUMMARY

Expenditures increased less than 1 percent as shown by the following table. This small increase represents an effective decrease in costs in light of the inflationary trend. Effective reductions in cost are attributable to decreases in budgeted staff levels and to increase in efficiency of operation because of the Divisional reorganization. The total net expenditure was $1,414,114, compared with $1,404,810 in fiscal year 1969-70.

Expense Category		Expenditure
Salaries		$1,091,460
Operating Expenses		525,163
General Expense	$48,742	
Printing	50,537	
Communications	25,961	
Travel, Out-of-State	2,033	
Travel, In-State	22,858	
Motor Vehicle Operations	18,720	
Rent, Land and Buildings	155,223	
Rent, Aircraft	146	
Professional Consulting Services	142,407	
Purchase of Technical Reports	3,454	
Repair and Maintenance	337	
Engineering Reproduction and Photography	17,757	
Laboratory Expense	7,385	
Library Services	227	
Specilized Training	82	
Agency Relocation	29,294	
Equipment		15,761
Cooperative Program with U.S. Geological Survey		2,250
Reimbursements		-220,520
TOTAL NET EXPENDITURE		$1,414,114

THE FUTURE

During the fiscal year, work on the Urban Geology Master Plan was begun. When completed, Phase One of this plan will serve as a guide for future programs to be conducted in California with regard to urban geology problems, definition of criteria and priorities for project work, and recommendations as to groups best suited to carry out the various kinds of geologic programs. The second phase of the plan will be developed in the coming year.

Also in the coming year, the long-range needs of California for mineral resources and for basic geologic investigations will be considered in greater depth. The results will provide a better guide for future Division activities in these fields.

The increased productivity of the Division during the past year should be reflected by a greater number of useful publications in fiscal year 1971-72.

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